

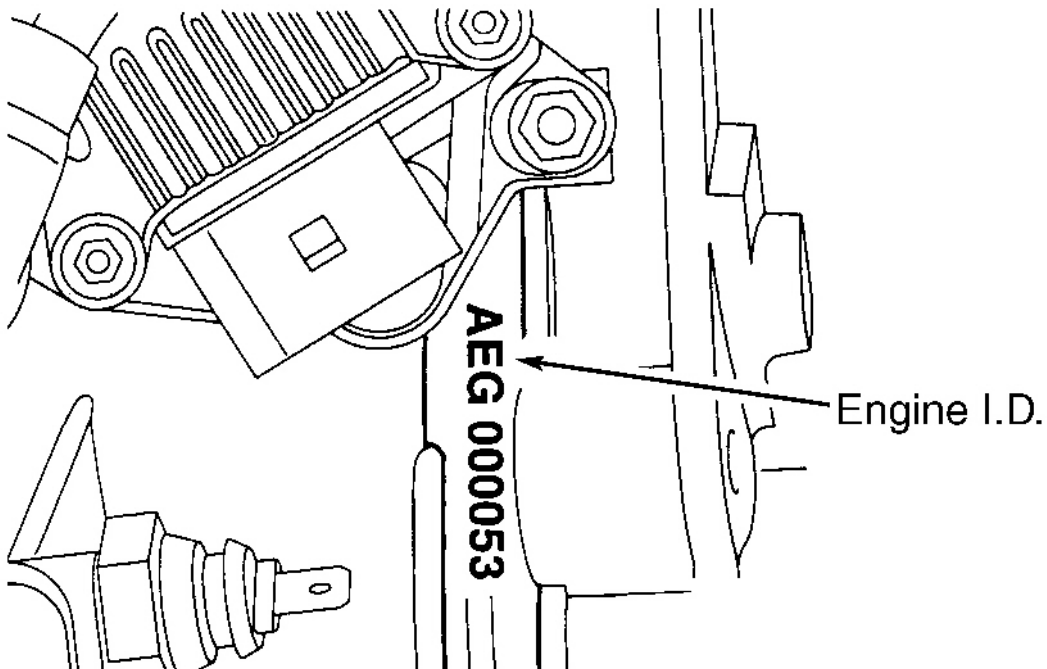
1998-2003 ENGINE PERFORMANCE

Basic Diagnostic Procedures - Beetle - Gasoline

IDENTIFICATION

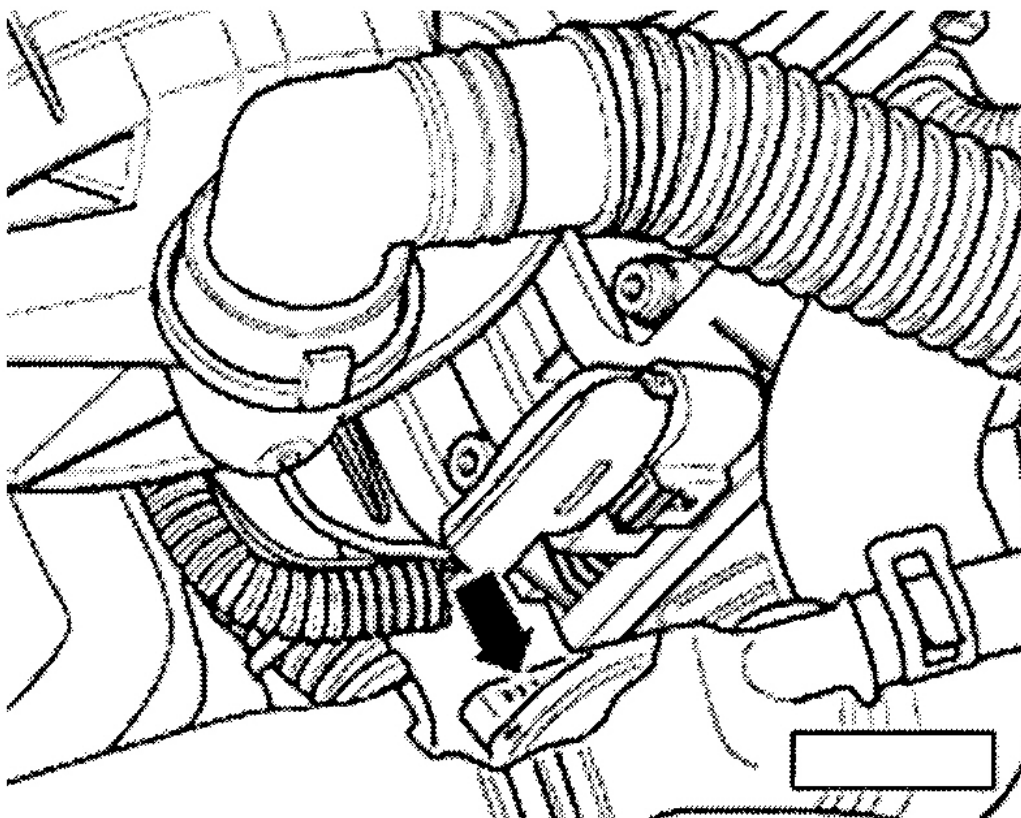
2.0L ENGINE

Engine identification is stamped on machined surface between engine and transmission. Additionally, there is a sticker, located on timing belt guard. Engine code is also included on vehicle data plate.



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Fig. 1: Locating Engine Identification Code (2.0L - AEG)
Courtesy of VOLKSWAGEN UNITED STATES, INC.



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Fig. 2: Locating Engine Code (2.0L - AVH, AZG, BDC, BEV & BGD)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

INTRODUCTION

The following diagnostic steps will help prevent overlooking a simple problem. This is also where to begin diagnosis for a no-start condition.

The first step in diagnosing any driveability problem is verifying the customer's complaint with a test drive under the conditions the problem reportedly occurred.

NOTE: Information that involve ECM sensors and components that generate DTCs are not covered in this article. See appropriate **SELF-DIAGNOSTICS** article, in **ENGINE PERFORMANCE**.

Performing a thorough Visual Inspection and checking for DTCs, may pin point faulty circuit, (vacuum or electrical) and/or faulty component or adjustment. See **VISUAL INSPECTION**. After performing Visual

Inspection, check for DTCs. See appropriate SELF-DIAGNOSTICS article. Most engine control problems result from mechanical breakdowns, poor electrical connections, or damaged/misrouted vacuum hoses.

NOTE: Perform all voltage tests using Digital Volt-Ohmmeter (DVOM) with a minimum 10-megohm input impedance, unless stated otherwise in test procedure.

PRELIMINARY INSPECTION

VISUAL INSPECTION

Prior to retrieving DTCs, perform a thorough visual inspection of underhood components. Check ground connections located on intake manifold, ground cable between engine and vehicle body and that battery cables are clean and tight. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL.

Check vacuum hoses for breakage and blockage. Check electrical wiring and harness connectors for damage and corrosion. Repair as necessary.

MECHANICAL INSPECTION

WARNING: DO NOT use ignition switch during compression tests on fuel injected vehicles. Use a remote starter to crank engine. Fuel injectors on many models are triggered by ignition switch during cranking mode, which can create a fire hazard or contaminate the engine's oiling system.

Compression

- 1. Engine oil temperature must be at least 86°F (30°C). Battery must be fully charged. All electrical consumers (lights and rear window defogger, etc.) must be switched off. If the vehicle is equipped with air conditioning, this must be switched off. On models with an automatic transmission selector lever in position "P" or "N".
- 2. Remove engine cover. On 2.0L engines, disconnect 6-pin connector from ignition coil with final output stage. On 1.8L engines, pull connector(s) off ignition coils. Remove ignition coils.
- 3. On all engines, turn off ignition. Remove fuse No. 32 (fuel injector power supply fuse) from fuse block at far left end of dash. See Fig. 3 .
- 4. Remove spark plugs. Have a second technician fully depress accelerator pedal.
- 5. Check engine mechanical condition with remote control starter switch and compression gauge. On 1.8L engines, install ignition coils and tighten mounting bolts to 89 INCH lbs. (10 N.m).

COMPRESSION SPECIFICATIONS

Application	(1) Specification
Normal Compression Pressure	
1.8L Turbo (2)	145-203 psi (10.0-14.0 bar)
	145-189 psi (10.0-13.0 bar)

2.0L ⁽²⁾	
Minimum Compression Pressure	
1.8L Turbo	101 psi (7.0 bar)
2.0L	109 psi (7.5 bar)
Maximum Variation Between Cylinders	
1.8 Turbo & 2.0L	44 psi (3.0 bar)
(1) Operate starter until tester shows no further increase.	
(2) Remove fuel injector power fuse No. 32 in instrument panel fuse block (behind far left end of dash). See Fig. 3 .	

Exhaust System Backpressure

A restricted exhaust system can be checked with a vacuum or pressure gauge. Remove heated oxygen sensor or air injection check valve (if equipped). Connect a 0-5 psi pressure gauge and operate engine at 2500 RPM. If exhaust system backpressure is greater than 3 psi, exhaust system or catalytic converter is plugged.

If a vacuum gauge is used, connect vacuum gauge hose to intake manifold vacuum port and start engine. Observe vacuum gauge. Open throttle part way and hold steady. If vacuum gauge reading slowly drops after stabilizing, check exhaust system for restriction.

FUEL SYSTEM

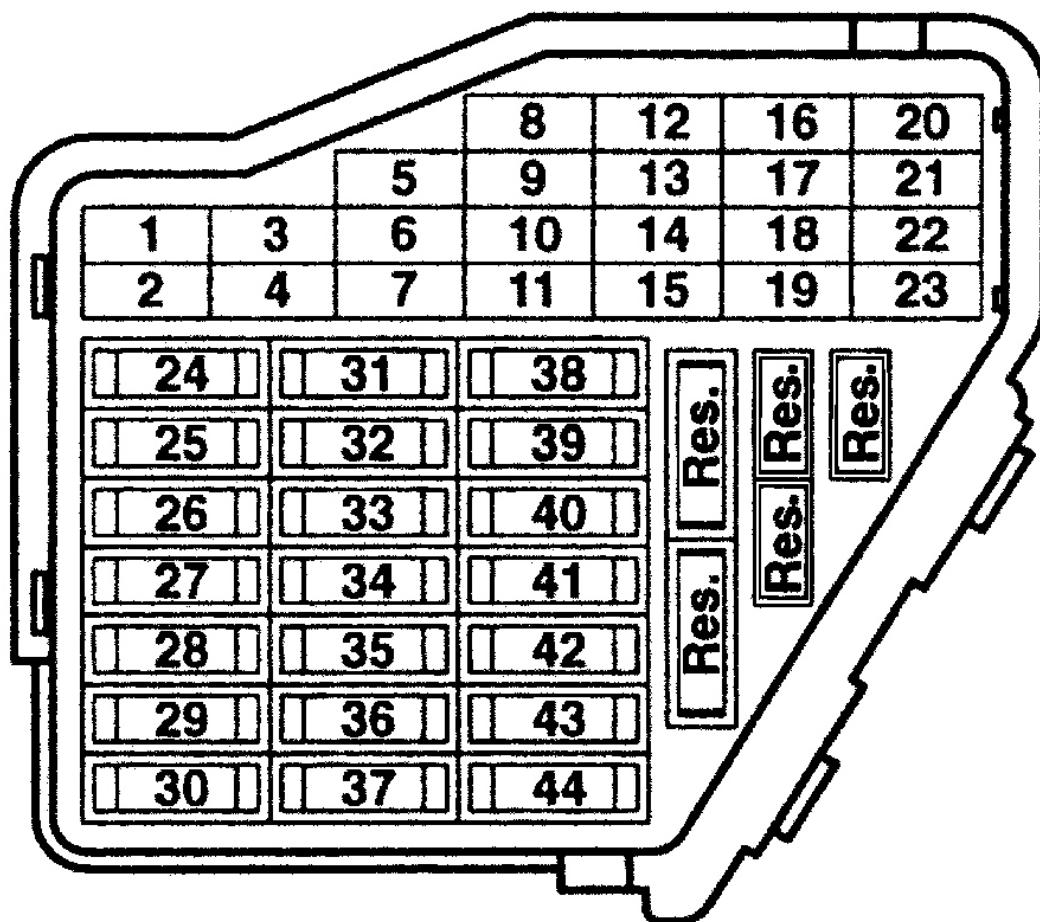
FUEL PRESSURE

Basic diagnosis of fuel system should begin with determining fuel system pressure.

WARNING: ALWAYS relieve fuel pressure before disconnecting any fuel injection-related component. See FUEL SYSTEM PRESSURE RELEASE . DO NOT allow fuel to contact engine or electrical components.

Fuel System Pressure Release

Turn ignition off. Disconnect ignition coil output stage wiring harness to deactivate ignition. To disable fuel pump, remove fuse No. 28 from fuse panel at far left end of dash. See **Fig. 3** . Place a clean shop rag around fuel line fitting and slowly loosen fitting. See **Fig. 4** or **Fig. 9** .



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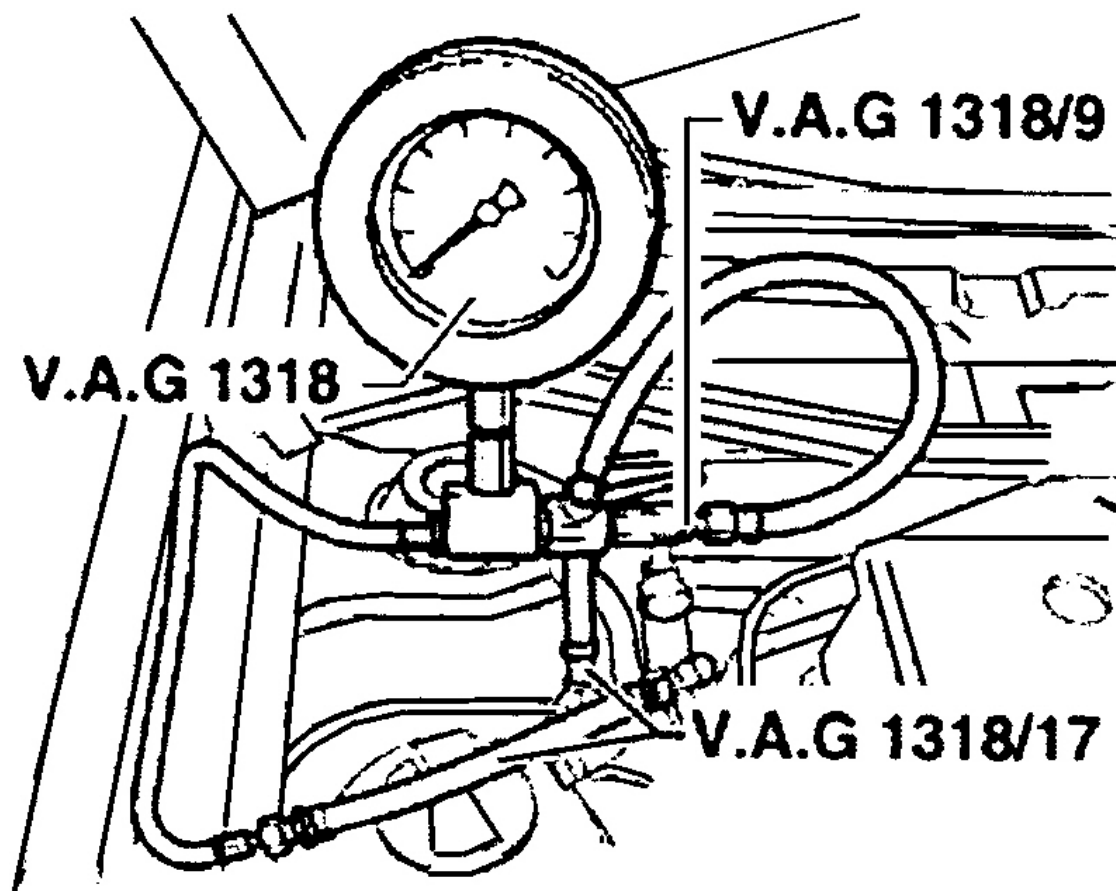
Fig. 3: Identifying Dash Fuse Panel Fuses
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

Fuel Pressure Test (1.8L Turbo)

1. Ensure ignition is off. Ensure battery voltage is at least 12 volts. Release fuel pressure, see **FUEL SYSTEM PRESSURE RELEASE**.

2. **NOTE:** Fuel pressure tester must be installed with the shut-off valve between the fuel supply line and the gauge for proper evaluation of residual pressure tests.

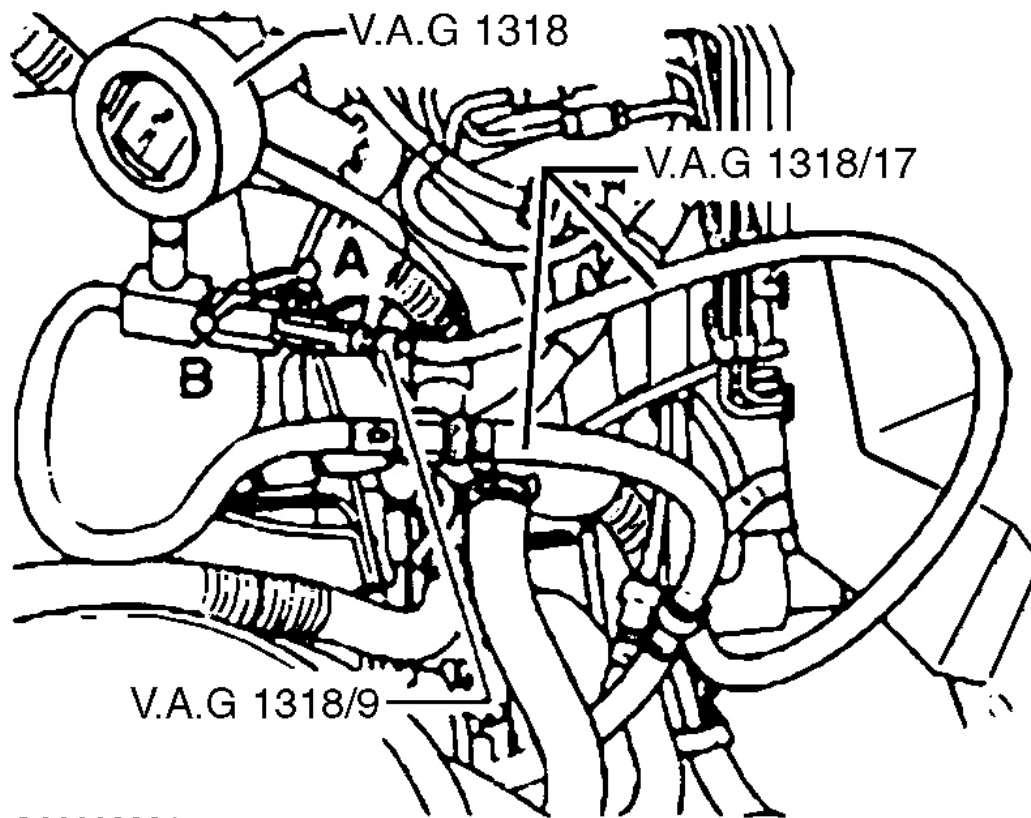
Connect Pressure Gauge (VAG 1318) at fuel supply line/hose in engine compartment. See **Fig. 4** and **Fig. 5**.



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Fig. 5: Connecting Fuel Pressure Gauge (1.8L Turbo & 2.0L - Engine Code BDC)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

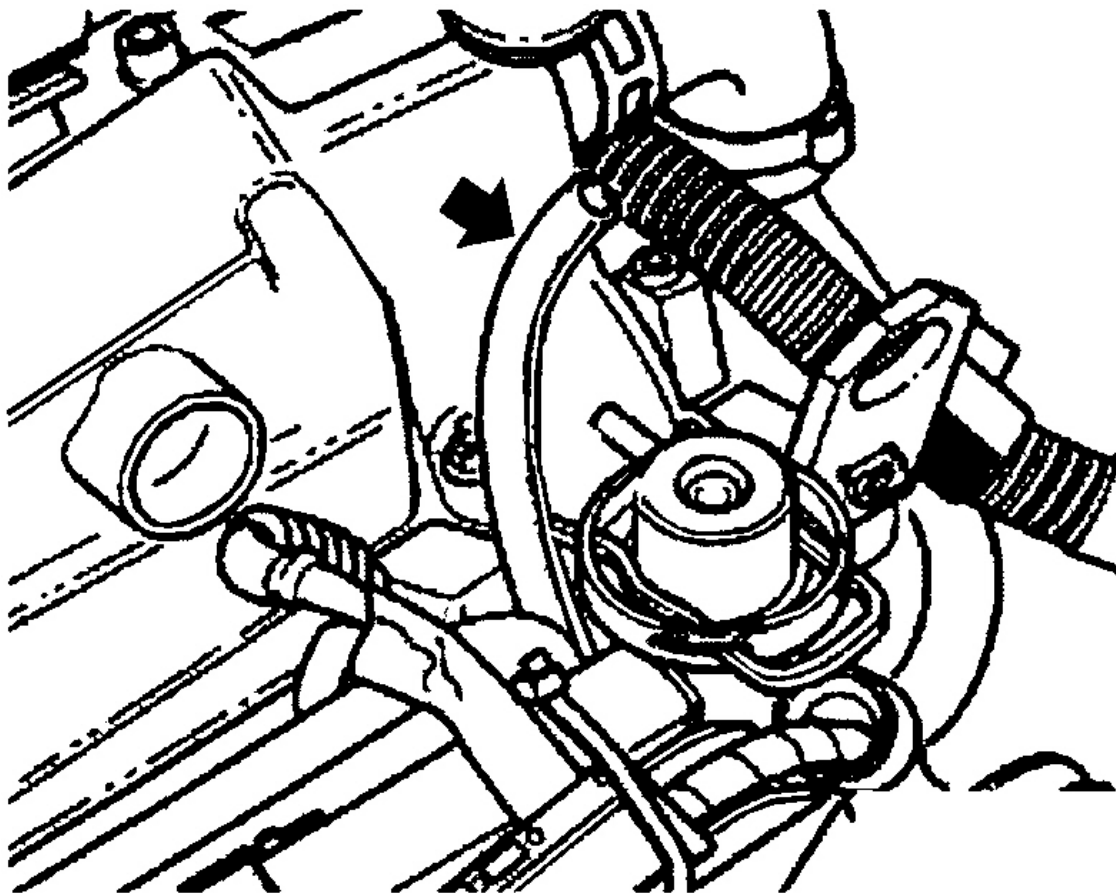
3. Open shut-off valve of fuel pressure gauge, lever points in the direction of flow. See **Fig. 6** . Reinstall fuel pump fuse No. 28.



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Fig. 6: Fuel Pressure Gauge Lever Position "A" Is Open & Gauge Lever Position "B" Is Closed
Courtesy of VOLKSWAGEN UNITED STATES, INC.

4. Start engine and idle. Fuel pressure should be within specification. See **FUEL PRESSURE SPECIFICATIONS (1.8L TURBO & 2.0L)** table. Continue to idle engine. Disconnect vacuum line from fuel pressure regulator on fuel rail. See **Fig. 7** . Fuel pressure should be within specification.



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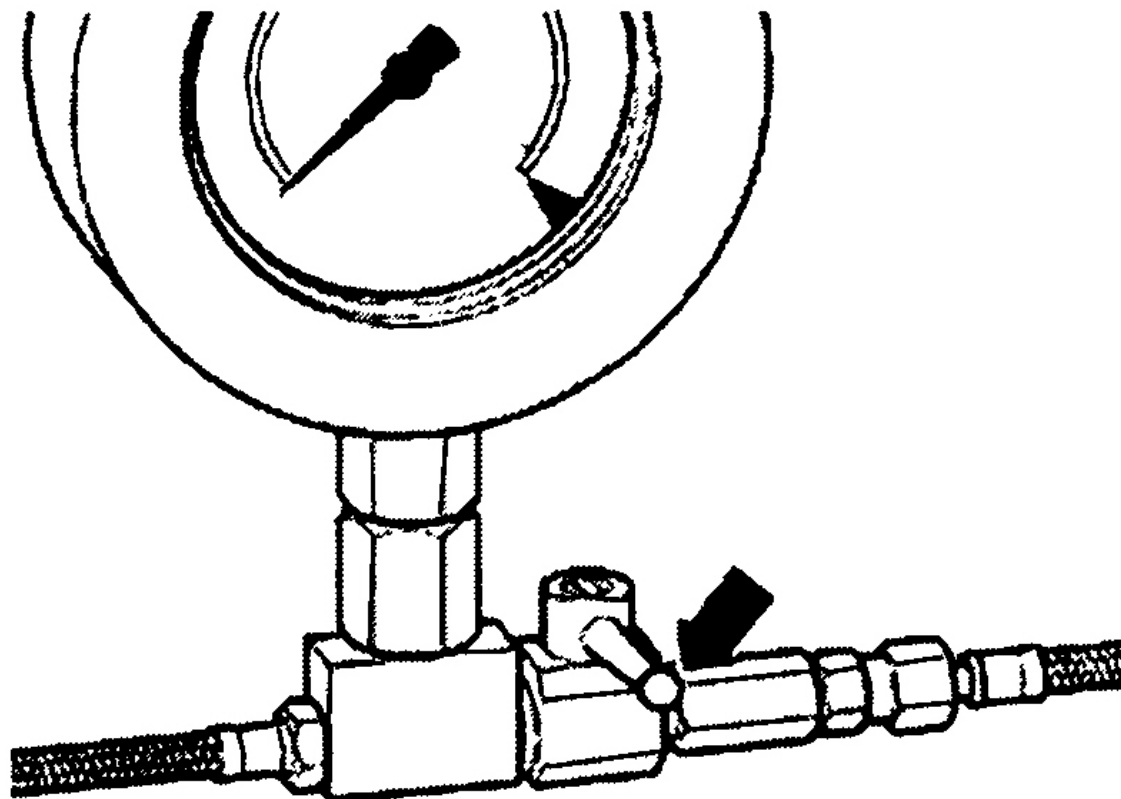
Fig. 7: Disconnecting Fuel Pressure Regulator Vacuum Hose (1.8L Turbo)
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

5. If fuel pressure is not as specified, check fuel pump volume. See **FUEL PUMP VOLUME CHECK (EXCEPT 2.0L ENGINE CODES BEV & BGD)**. If fuel pressures are okay, go to next step.

6. **NOTE:** Fuel system residual pressure (holding pressure) test checks integrity of fuel lines, fuel fittings, fuel pressure regulator, fuel injectors and fuel pump check valve.

Perform fuel system residual pressure test. Reinstall vacuum hose on fuel pressure regulator and continue to run engine at idle. Turn engine off. Check for fuel leaks. Check residual fuel pressure after 10 minutes. See **FUEL PRESSURE SPECIFICATIONS (1.8L TURBO & 2.0L)** table. If residual pressure drops below specification, start engine and run at idle speed.

7. Switch ignition off after pressure has built up. At same time, close pressure gauge cut-off handle (handle at 90 degrees to fuel flow direction). See **Fig. 8** . Gauge will now read fuel isolated in fuel rail.



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Fig. 8: Fuel Pressure Test Gauge (Lever In Closed Position)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

8. If residual fuel pressure does NOT drop, check fuel pump check valve. See **FUEL PUMP CHECK VALVE** . If residual pressure drops again, go to next step.
9. Open fuel pressure gauge shut-off handle to allow fuel flow. Start engine and run at idle speed. After fuel pressure has built up, turn ignition off. At same time pinch/seal fuel return line together.
10. If fuel pressure does NOT drop, replace faulty fuel pressure regulator. If fuel pressure drops again, check fuel lines, connections and "O" rings for leaks. Check pressure gauge for leaks. Check for leaking fuel injectors. Perform fuel injector leak test. See appropriate SYSTEM & COMPONENT TESTING article.

FUEL PRESSURE SPECIFICATIONS (1.8L TURBO & 2.0L)

Function	psi (bar)
System Pressure (Except 2.0L - Engine Codes BEV & BGD)	
With Engine Idling ⁽¹⁾	36 (2.5)
With Engine Idling ⁽²⁾	44 (3.0)
Residual Pressure ⁽³⁾	29 (2.0)
System Pressure (2.0L - Engine Codes BEV & BGD)	
With Engine Idling ⁽¹⁾	58 (4.0)
Residual Pressure ⁽³⁾	29 (2.0)

- (1) With fuel pressure regulator vacuum hose connected.
- (2) With fuel pressure regulator vacuum hose disconnected.
- (3) Minimum pressure after 10 minutes. If fuel system has passed this test, fuel pump check valve is okay.

Fuel Pressure Test (2.0L - Engine Codes AEG, AVH & AZG)

1. For engine identification, see **IDENTIFICATION**. Ensure engine is off. Ensure battery voltage is at least 12 volts. Release fuel pressure. See **FUEL SYSTEM PRESSURE RELEASE**.
- 2.

NOTE: Fuel pressure tester must be installed with the shut-off valve between the fuel supply line and the gauge for proper evaluation of residual pressure tests.

Connect Pressure Gauge (VAG 1318), or equivalent, at fuel supply line/hose in engine compartment. See **Fig. 9** and **Fig. 10**. Open shut-off valve of fuel pressure gauge; lever points in the direction of flow.

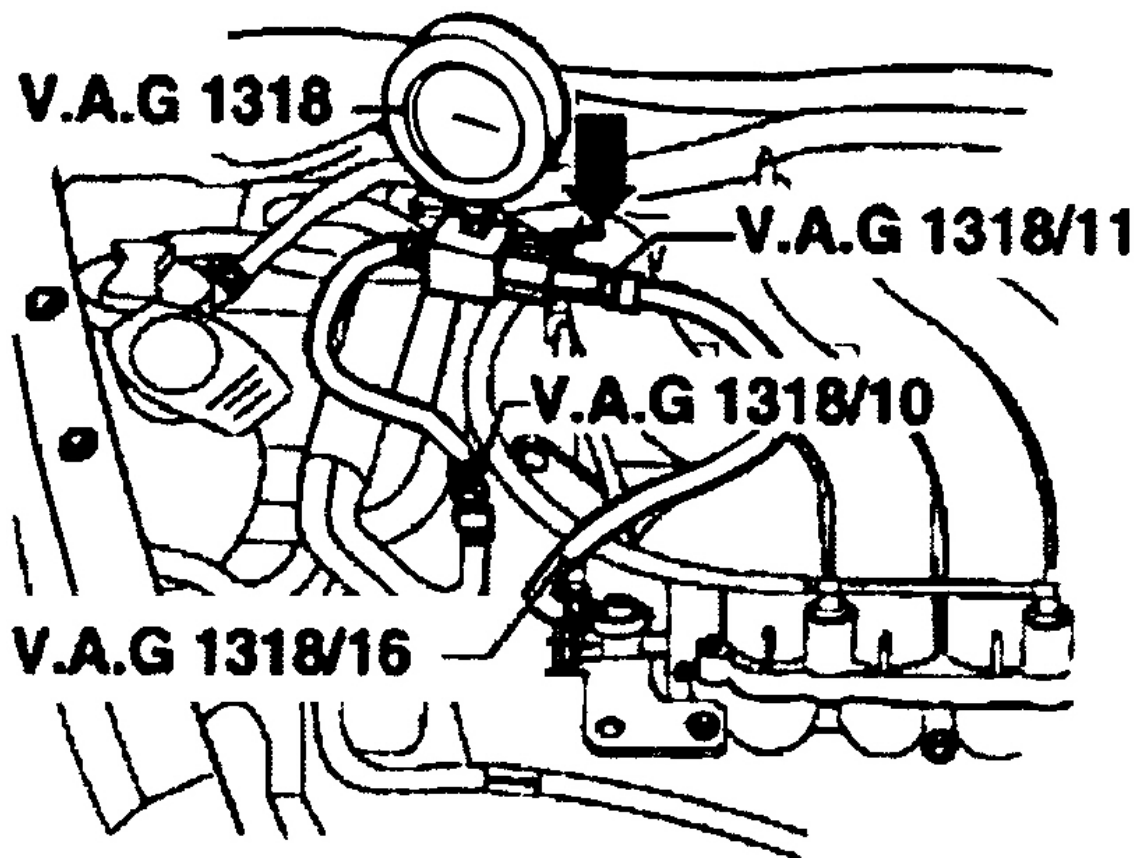
3. Reinstall fuel pump (No. 28) fuse in dash fuse box.
4. Start engine and idle. Fuel pressure should be within specification. See **FUEL PRESSURE SPECIFICATIONS (1.8L TURBO & 2.0L)** table. Continue to idle engine. Disconnect vacuum line from fuel pressure regulator on fuel rail. See **Fig. 11**. Fuel pressure should be within specification.
5. If fuel pressure is not as specified, check fuel pump volume. See **FUEL PUMP VOLUME CHECK (EXCEPT 2.0L ENGINE CODES BEV & BGD)**. If fuel pressures are okay, go to next step.

6.

NOTE: Fuel system residual pressure (holding pressure) test checks integrity of fuel lines, fuel fittings, fuel pressure regulator, fuel injectors and fuel pump check valve.

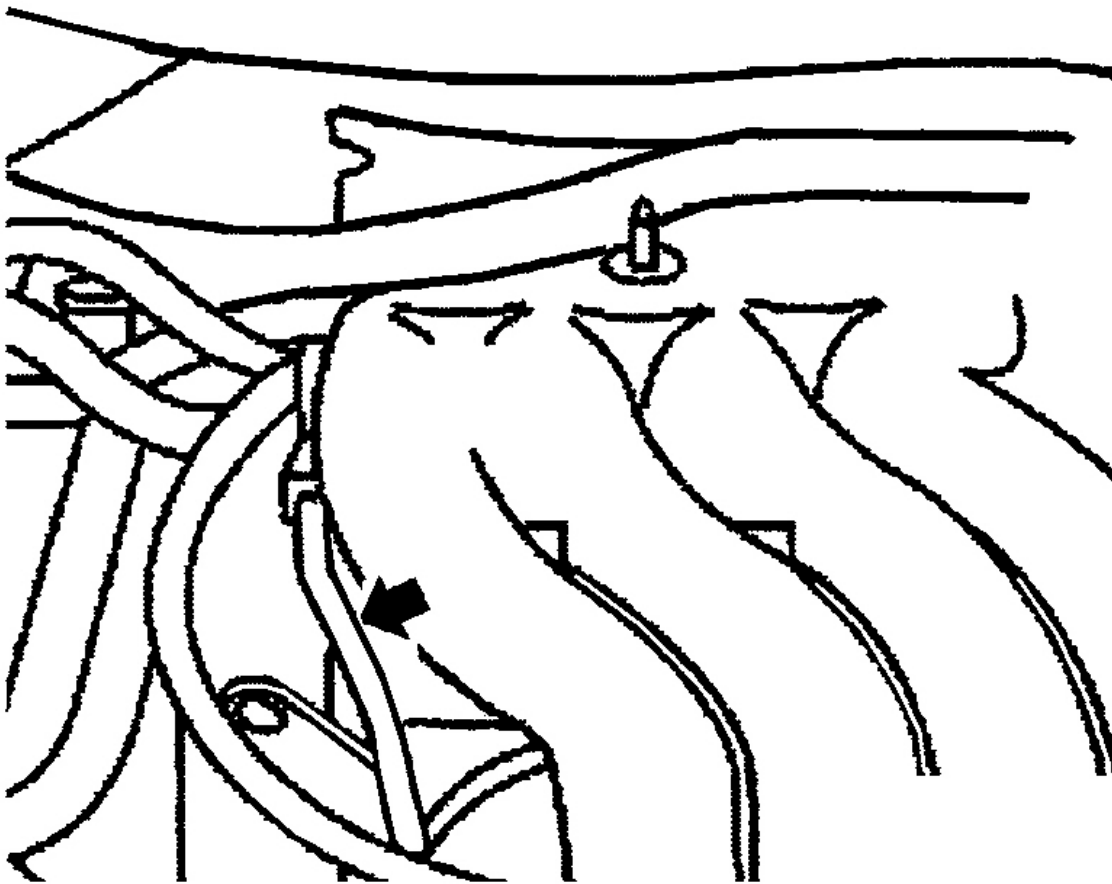
Perform fuel system residual pressure test. Reinstall vacuum hose on fuel pressure regulator and continue to run engine at idle. Turn engine off. Check for fuel leaks. Check residual fuel pressure after 10 minutes. See **FUEL PRESSURE SPECIFICATIONS (1.8L TURBO & 2.0L)** table. If residual pressure drops below specification, start engine and run at idle speed.

7. Switch ignition off after pressure has built up. At same time, close pressure gauge cut-off handle (handle at 90 degrees to fuel flow direction). See **Fig. 8**. Gauge will now read fuel isolated in fuel rail.
8. If residual fuel pressure does NOT drop, check fuel pump check valve. See **FUEL PUMP CHECK VALVE**. If residual pressure drops again, go to next step.
9. Open fuel pressure gauge shut-off handle to allow fuel flow. Start engine and run at idle speed. After fuel pressure has built up, turn ignition off. At same time pinch/seal fuel return line together. See **Fig. 9**.
10. If fuel pressure does NOT drop, replace faulty fuel pressure regulator. If fuel pressure drops again, check fuel lines, connections and "O" rings for leaks. Check pressure gauge for leaks. Check for leaking fuel injectors. Perform fuel injector leak test. See appropriate SYSTEM & COMPONENT TESTING article.



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Fig. 10: Connecting Fuel Pressure Test Gauge (2.0L - Engine Codes AEG, AVH & AZG)
Courtesy of VOLKSWAGEN UNITED STATES, INC.



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Fig. 11: Disconnecting Fuel Pressure Regulator Vacuum Hose (2.0L - Engine Codes AEG, AVH & AZG)
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

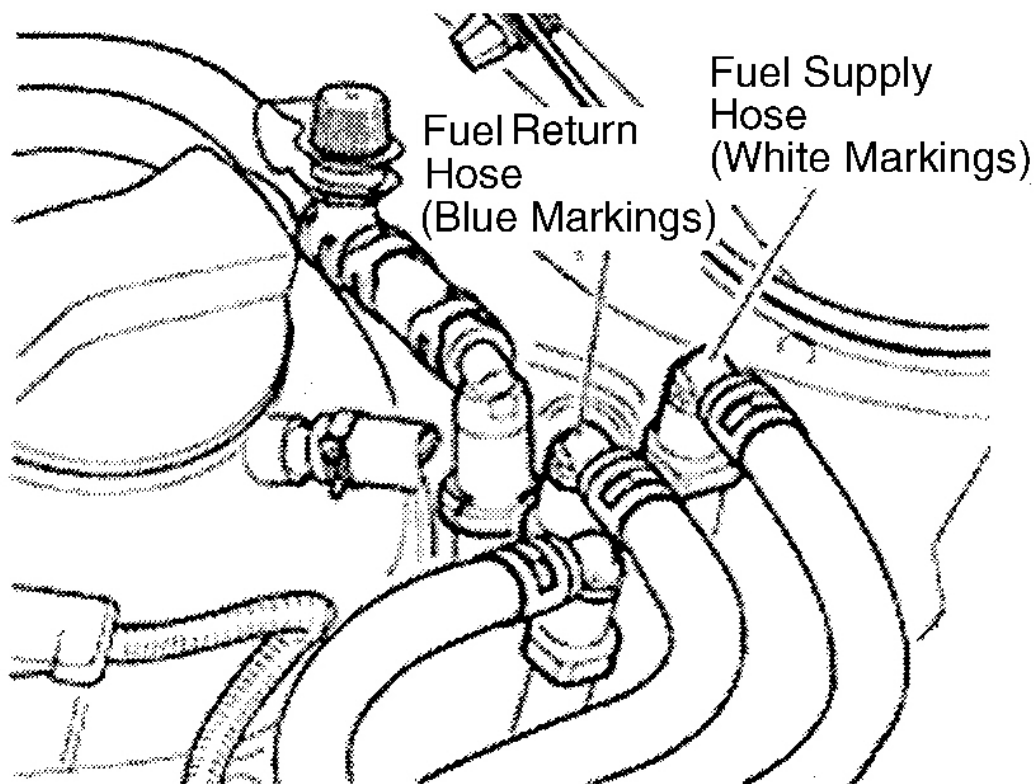
Fuel Pressure Test (2.0L - Engine Code BDC)

1. For engine identification, see **IDENTIFICATION** . Ensure engine is off. Ensure battery voltage is at least 12 volts. Release fuel pressure. See **FUEL SYSTEM PRESSURE RELEASE** .

2.

NOTE: Fuel pressure tester must be installed with the shut-off valve between the fuel supply line and the gauge for proper evaluation of residual pressure tests.

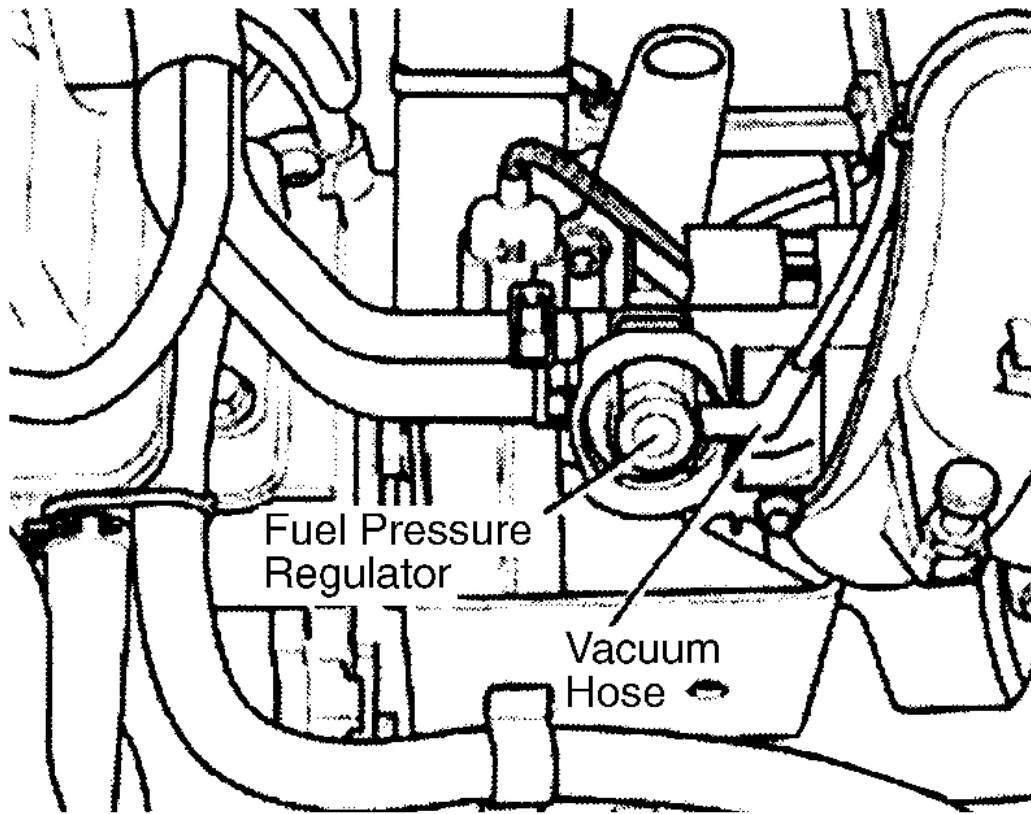
Connect Pressure Gauge (VAG 1318), or equivalent, at fuel supply line/hose in engine compartment. See **Fig. 12** and **Fig. 5** . Press locking ring inward to release fuel hose. Open shut-off valve of fuel pressure gauge; lever points in the direction of flow.



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Fig. 12: Locating Fuel Supply/Return Lines (2.0L - Engine Code BDC)
Courtesy of VOLVO CARS OF NORTH AMERICA.

3. Reinstall fuel pump (No. 28) fuse in dash fuse box.
4. Start engine and idle. Fuel pressure should be within specification. See **FUEL PRESSURE SPECIFICATIONS (1.8L TURBO & 2.0L)** table. Continue to idle engine. Disconnect vacuum line from fuel pressure regulator on fuel rail. See **Fig. 13** . Fuel pressure should be within specification.



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Fig. 13: Locating Fuel Pressure Regulator (2.0L - Engine Code BDC)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

5. If fuel pressure is not as specified, check fuel pump volume. See **FUEL PUMP VOLUME CHECK (EXCEPT 2.0L ENGINE CODES BEV & BGD)**. If fuel pressures are okay, go to next step.

6. **NOTE:** Fuel system residual pressure (holding pressure) test checks integrity of fuel lines, fuel fittings, fuel pressure regulator, fuel injectors and fuel pump check valve.

Perform fuel system residual pressure test. Reinstall vacuum hose on fuel pressure regulator and continue to run engine at idle. Turn engine off. Check for fuel leaks. Check residual fuel pressure after 10 minutes. See **FUEL PRESSURE SPECIFICATIONS (1.8L TURBO & 2.0L)** table. If residual pressure drops below specification, start engine and run at idle speed.

7. Switch ignition off after pressure has built up. At same time, close pressure gauge cut-off handle (handle at 90 degrees to fuel flow direction). See **Fig. 8**. Gauge will now read fuel isolated in fuel rail.

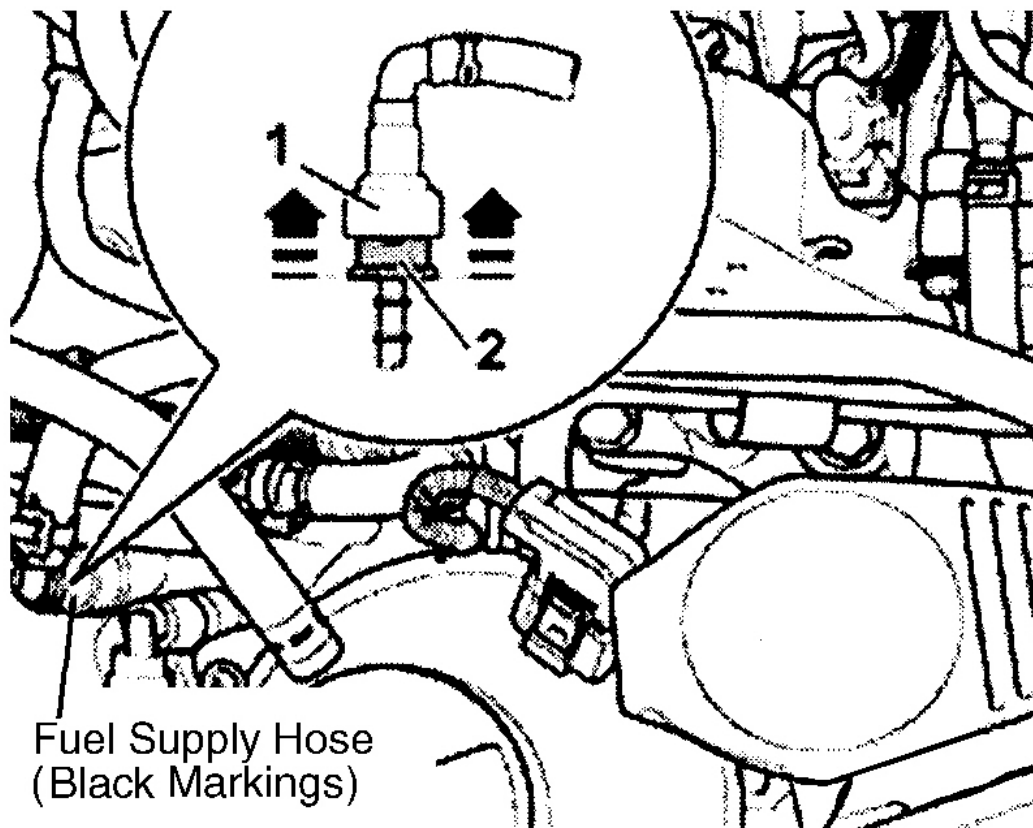
8. If residual fuel pressure does NOT drop, check fuel pump check valve. See **FUEL PUMP CHECK VALVE** . If residual pressure drops again, go to next step.
9. Open fuel pressure gauge shut-off handle to allow fuel flow. Start engine and run at idle speed. After fuel pressure has built up, turn ignition off. At same time pinch/seal fuel return line together. See **Fig. 12** .
10. If fuel pressure does NOT drop, replace faulty fuel pressure regulator. If fuel pressure drops again, check fuel lines, connections and "O" rings for leaks. Check pressure gauge for leaks. Check for leaking fuel injectors. Perform fuel injector leak test. See appropriate SYSTEM & COMPONENT TESTING article.

Fuel Pressure Test (2.0L - Engine Codes BEV & BGD)

1. For engine identification, see **IDENTIFICATION** . Ensure engine is off. Ensure battery voltage is at least 12 volts. Release fuel pressure. See **FUEL SYSTEM PRESSURE RELEASE** .

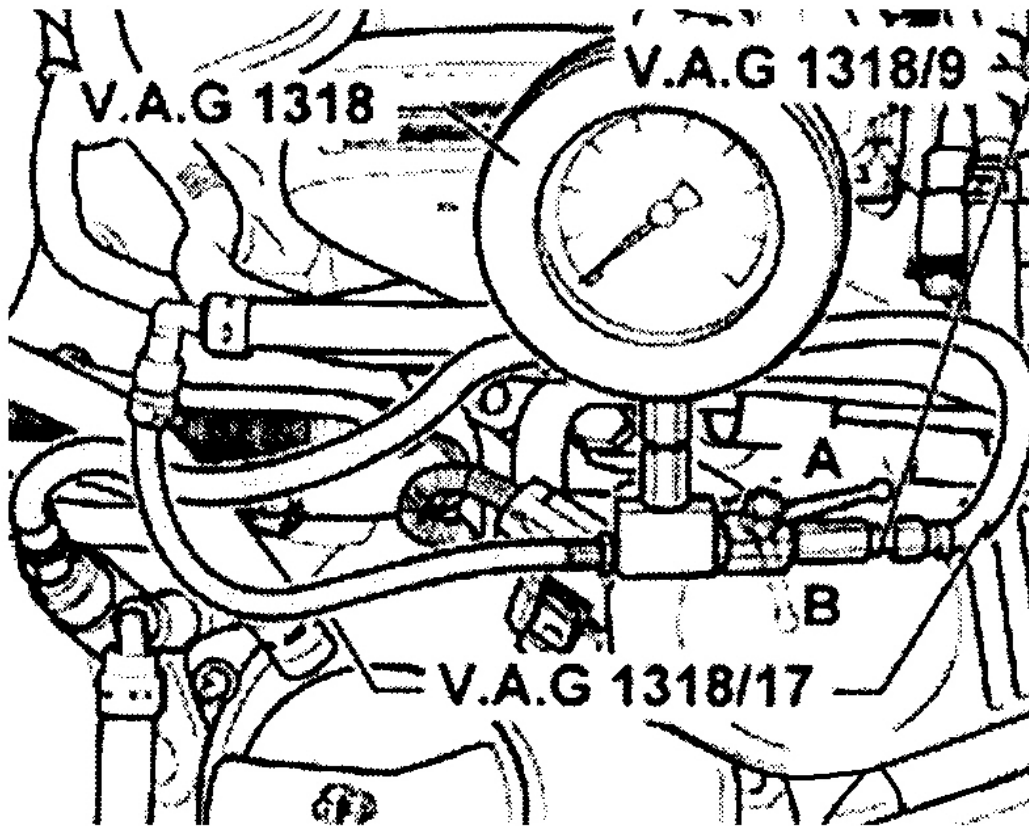
2.
NOTE: **Fuel pressure tester must be installed with the shut-off valve between the fuel supply line and the gauge for proper evaluation of residual pressure tests.**

Connect Pressure Gauge (VAG 1318), or equivalent, at fuel supply line/hose in engine compartment. See **Fig. 14** and **Fig. 15** . To remove fuel supply hose, slide safety ring (2) in the union (1). See **Fig. 14** . Open shut-off valve of fuel pressure gauge; lever points in the direction of flow.



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Fig. 14: Locating Fuel Supply Line (2.0L - Engine Codes BEV & BGD)
Courtesy of VOLKSWAGEN UNITED STATES, INC.



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Fig. 15: Connecting Fuel Pressure Gauge To Engine (2.0L - BEV & BGD)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

3. Reinstall fuel pump (No. 28) fuse in dash fuse box.
4. Start engine and idle. Fuel pressure should be within specification. See **FUEL PRESSURE SPECIFICATIONS (1.8L TURBO & 2.0L)** table. Continue to idle engine.
5. If fuel pressure is not as specified, check fuel pump check valve and fuel pressure regulator. See **FUEL PUMP CHECK VALVE** . See **FUEL PRESSURE REGULATOR TEST (2.0L - ENGINE CODES BEV & BGD)** . If fuel pressures are okay, go to next step.
- 6.

NOTE: Fuel system residual pressure (holding pressure) test checks integrity of fuel lines, fuel fittings, fuel pressure regulator, fuel injectors and fuel pump check valve.

Perform fuel system residual pressure test. Continue to run engine at idle. Turn engine off. Check for fuel leaks. Check residual fuel pressure after 10 minutes. See **FUEL PRESSURE SPECIFICATIONS (1.8L**

TURBO & 2.0L) table. If residual pressure drops below specification, start engine and run at idle speed.

7. Switch ignition off after pressure has built up. At same time, close pressure gauge cut-off handle (handle at 90 degrees to fuel flow direction). See **Fig. 8** . Gauge will now read fuel isolated in fuel rail.
8. If residual fuel pressure does NOT drop, check fuel pump check valve and fuel pressure regulator. See **FUEL PUMP CHECK VALVE** . See **FUEL PRESSURE REGULATOR TEST (2.0L - ENGINE CODES BEV & BGD)** . If residual pressure drops again, go to next step.
9. If fuel pressure drops again, check fuel lines, connections and "O" rings for leaks. Check pressure gauge for leaks. Check for leaking fuel injectors. Perform fuel injector leak test. See appropriate SYSTEM & COMPONENT TESTING article.

Fuel Pressure Regulator Test (2.0L - Engine Codes BEV & BGD)

NOTE: **The 2.0L engine Codes BEV and BGD is equipped with non-return type fuel system. Fuel pressure regulator is part of fuel pump assembly.**

1. BEFORE check fuel pressure regulator, ensure fuel pump check valve is operating correctly. See **FUEL PUMP CHECK VALVE** . Ensure fuel supply line is not leaking.
2. Turn off ignition. Remove fuse No. 28 from fuse block at far left end of dash. See **Fig. 3** .
3. Connect VAG1348/3A remote control to fuse 28 socket. Connect one end to B+ and other to appropriate fuse socket cavity. See **Fig. 17** .
4. Connect VAG1318 pressure gauge with adapters, or equivalent, to fuel supply line on fuel rail. To remove fuel supply hose, slide safety ring (2) in the union (1). See **Fig. 14** . Do not connect pressure gauge to fuel rail. Place fuel pressure gauge line in a fuel measuring container. See **Fig. 16** .
5. Close shut-off valve on fuel pressure gauge. Lever is at right angles to direction of flow. See B in **Fig. 16** .
6. Operate VAG1348/3A remote control until pressure gauge reads 58 psi (4 bar). If pressure builds up too high, bleed off until correct pressure is obtained.
7. Watch pressure on fuel gauge. Over a period of 30 minutes, pressure may not drop below 46.2 psi (3.2 bar). If the pressure drops, check line connections for proper sealing. If fuel lines are okay, replace fuel pressure regulator.

FUEL PUMP VOLUME CHECK (EXCEPT 2.0L ENGINE CODES BEV & BGD)

CAUTION: Models with airbag are equipped with crash fuel shut-off system. Fuel shut-off system reduces danger of fire in a crash when fuel pump is switched off via fuel pump relay. At the same time this system improves starting of the engine. When the door is opened the fuel pump is activated for 2 seconds to build up the pressure in fuel system.

WARNING: Fuel system is under pressure. Before opening fuel system place cloth around connection. Then release pressure by carefully loosening connection. Always wear eye protection and wear fuel-resistant gloves when disconnecting fuel system connections.

1. Remove fuel filler cap. Connect VAG1318 pressure gauge with adapters, or equivalent, to fuel supply line on fuel rail. Push buttons on hose couplings to release fuel lines. Do not connect pressure gauge to fuel rail. Place fuel pressure gauge line in a fuel measuring container. See **Fig. 16** .

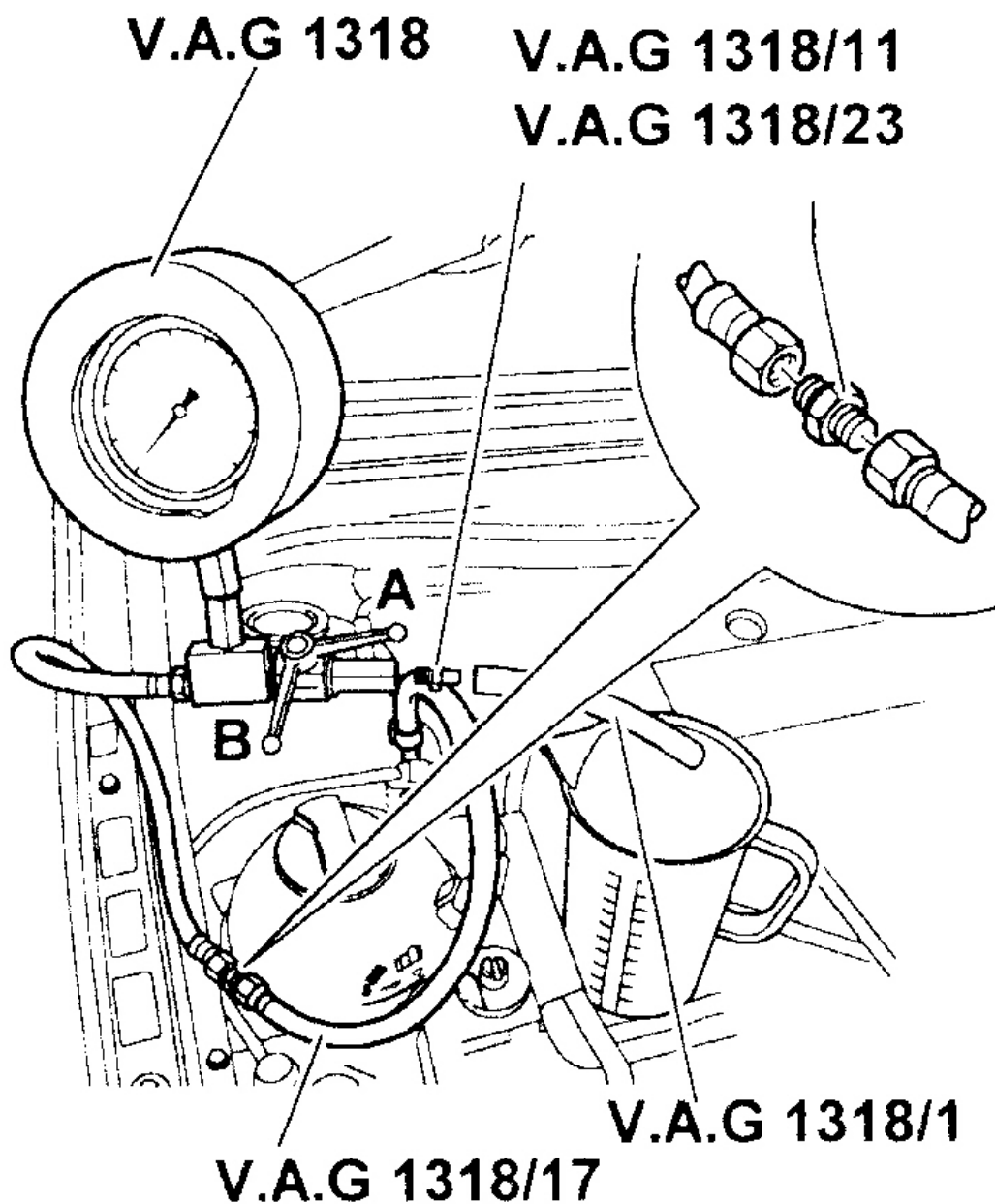


Fig. 16: Attaching Fuel Pressure Gauge To Check Fuel Pump Volume
Courtesy of VOLKSWAGEN UNITED STATES, INC.

2. Open shut-off valve on fuel pressure gauge. Lever points in direction of flow. See A in **Fig. 16** .
3. Remove fuse No. 28 in fuse panel behind far left side of dash. See **Fig. 3** . Connect VAG1348/3A remote control to fuse 28 socket. Connect one end to B+ and other to appropriate fuse socket cavity. See **Fig. 17** . While operating VAG1348/3A remote control to run fuel pump, close shut-off valve slowly until gauge reads 44 psi (3 bar) on all engines except 2.0L with engine codes BEV and BGD. On 2.0L engine codes BEV and BGD, close shut-off valve slowly until gauge reads 51 psi (3.5 bar). Do not change position of shut-off valve (leave shut-off valve in closed position). Empty fuel measuring container.

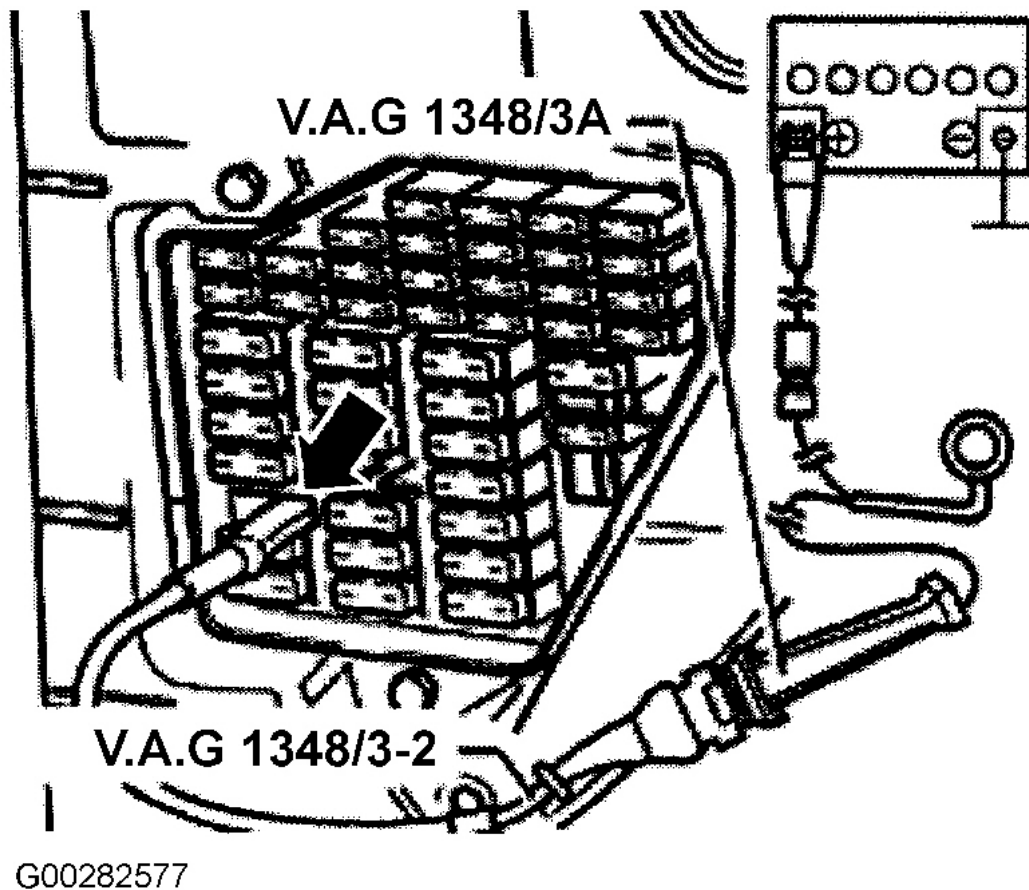
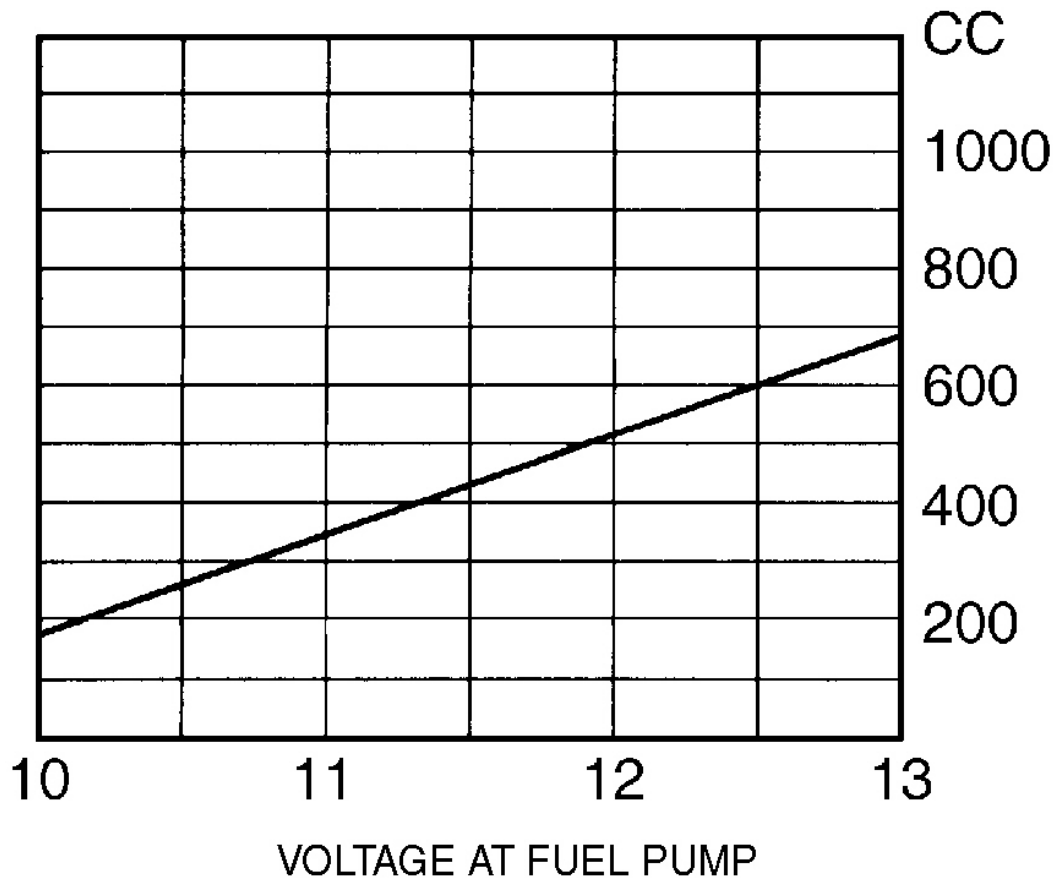


Fig. 17: Connecting Remote Control VAG 1348/3A With Adapter Cable VAG 1348/3-2 To Fuse Block
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE: Quantity of fuel delivered depends on battery voltage. Voltage at fuel pump is about 2 volts less than battery voltage.

Connect DVOM to battery. Operate remote control for 30 seconds. Record battery voltage.

5. Check fuel pump volume and compare to specification. See **Fig. 18** . Voltage shown on graph in **Fig. 18** is voltage at fuel pump. Subtract 2 volts from battery voltage to estimate fuel pump voltage. Fuel pump volume shown is minimum delivery in 30 seconds.



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Fig. 18: Determining Fuel Pump Volume In 30 Seconds (Voltage Measured At Fuel Pump Shown; 2 Volts Less Than Battery Voltage)

Courtesy of VOLKSWAGEN UNITED STATES, INC.

6. If minimum deliver rate is NOT as specified, check fuel filter and lines for possible restrictions (kinks) or blockages. Pull fuel supply hose off inlet to fuel filter. Connect fuel pressure gauge between fuel supply line and fuel filter. See **Fig. 19** .

for 2 seconds to build up the pressure in fuel system.

WARNING: Fuel system is under pressure. Before opening fuel system place cloth around connection. Then release pressure by carefully loosening connection. Always wear eye protection and wear fuel-resistant gloves when disconnecting fuel system connections.

1. Remove fuel filler cap. Connect VAG1318 pressure gauge with adapters, or equivalent, to fuel supply line on fuel rail. Do not connect pressure gauge to fuel rail. Place fuel pressure gauge line in a fuel measuring container. See **Fig. 16** .
2. Close shut-off valve on fuel pressure gauge. Lever is at right angles to direction of flow. See B in **Fig. 16** .
3. Remove fuse No. 28 in fuse panel behind far left side of dash. See **Fig. 3** . Connect VAG1348/3A remote control to fuse 28 socket. Connect one end to B+ and other to appropriate fuse socket cavity. See **Fig. 17** . Operate VAG1348/3A remote control until pressure gauge reads 44 psi (3 bar). If pressure builds up too high, bleed off until correct pressure is obtained.
4. Watch pressure on fuel gauge. Pressure may not drop below 36.2 psi (2.5 bar) after 10 minutes. If the pressure continues to drop, check line connections for proper sealing. If fuel lines are okay, replace fuel pump.

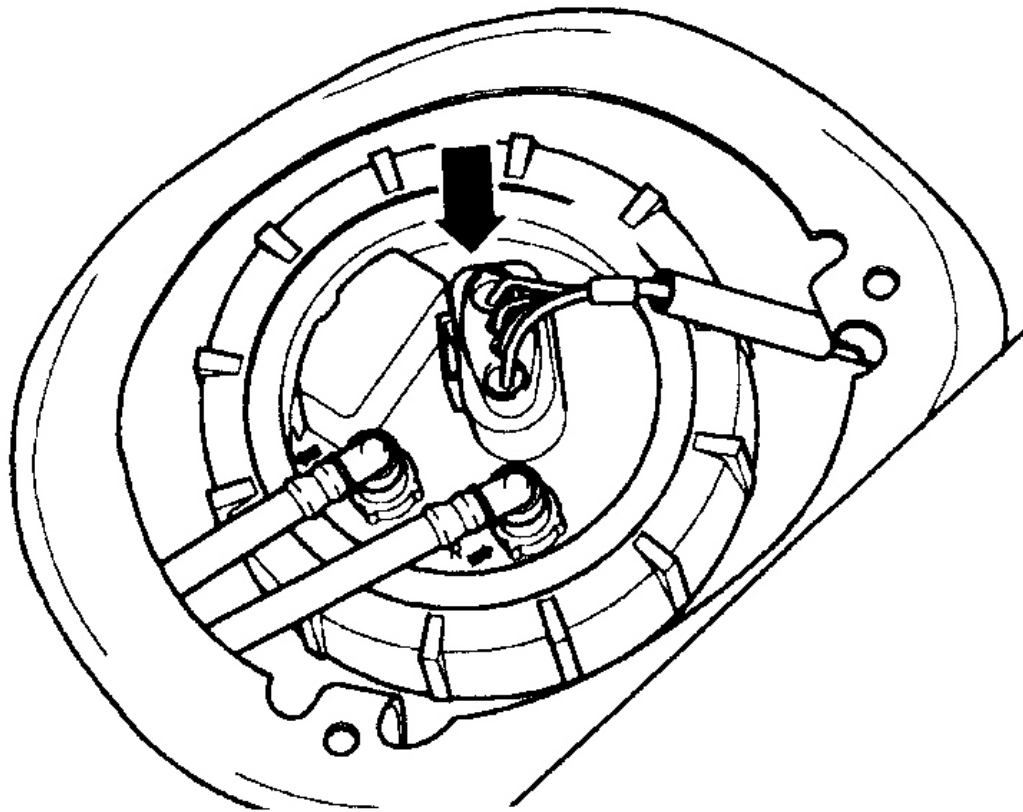
NOTE: Fuel pump can be removed from inside vehicle. Remove cover in floor pan under rear seat to access fuel pump/sending unit assembly.

FUEL PUMP CURRENT DRAW

If fuel pump pressure and volume are correct, but fuel pump circuit problem is suspected, check fuel pump current draw.

NOTE: Fuel pump assembly access cover is under rear seat. It is not necessary to remove fuel tank to remove fuel pump.

Fuel pump current draw can be checked at fuel pump assembly unit 4-pin connector under access cover. See **Fig. 20** . Maximum fuel pump current draw is 8 amps. If fuel pump current draw is too high, replace fuel pump. For fuel pump wiring, see appropriate ENGINE PERFORMANCE wiring in SYSTEM WIRING DIAGRAMS in ELECTRICAL.



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Fig. 20: Locating Fuel Pump Assembly
Courtesy of VOLKSWAGEN UNITED STATES, INC.

IGNITION SYSTEMS

Any fault with ignition system will set DTC. See appropriate SELF-DIAGNOSTICS article in ENGINE PERFORMANCE.

IDLE SPEED & IGNITION TIMING

Any fault with idle speed or ignition timing will set a DTC. See appropriate SELF-DIAGNOSTICS article in ENGINE PERFORMANCE.

2000-2003 ENGINE PERFORMANCE

Basic Diagnostic Procedures - Beetle, Diesel

INTRODUCTION

The following diagnostic steps will help prevent overlooking a simple problem. This is also where to begin diagnosis for a no-start condition.

The first step in diagnosing any driveability problem is verifying the customer's complaint with a test drive under the conditions the problem reportedly occurred.

Information that involves ECM sensors and components that generate DTCs are not covered in this article. See appropriate SELF-DIAGNOSTICS article in ENGINE PERFORMANCE.

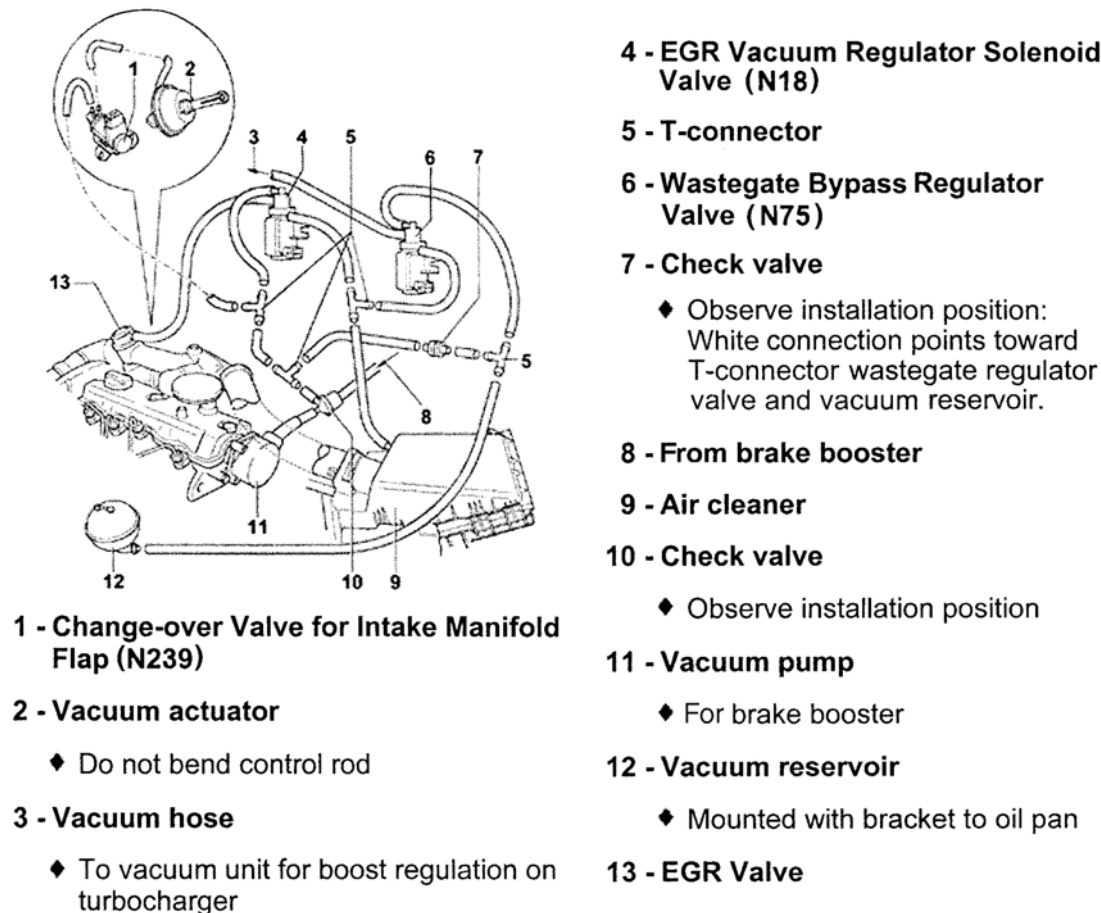
Performing a thorough Visual Inspection and checking for DTCs, may pin point faulty circuit (vacuum or electrical) and/or faulty component or adjustment. See **VISUAL INSPECTION**. After performing Visual Inspection, check for DTCs, see appropriate SELF-DIAGNOSTICS article. Most engine control problems result from mechanical breakdowns, poor electrical connections, or damaged/misrouted vacuum hoses.

NOTE: Perform all voltage tests using Digital Volt-Ohmmeter (DVOM) with a minimum 10-megohm input impedance, unless stated otherwise in test procedure.

PRELIMINARY INSPECTION & ADJUSTMENTS

VISUAL INSPECTION

1. Visually inspect all electrical wiring, looking for chafed, stretched, cut or pinched wiring. Ensure electrical connectors fit tightly and are not corroded. Check for loose or defective electrical connections on starter motor. Ensure all vacuum hoses are properly routed and are not pinched or cut. See **Fig. 1** to verify routing and connections. Inspect air induction system for possible vacuum leaks.
2. Check air filter for restriction or damage. Ensure turbocharger and charge air cooler inlet and outlet ducts clamps are tight. Ensure glow plug electrical connectors are tight.



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Fig. 1: Vacuum Hose Routing Diagram
 Courtesy of VOLKSWAGEN UNITED STATES, INC.

MECHANICAL INSPECTION

Engine Compression

Engine must be at operating temperature. Battery must be fully charged.

1. Disconnect 10-pin fuel cut-off valve electrical connector (located on diesel injection pump) before performing compression check.
2. Disconnect connectors from glow plugs. Remove all glow plugs.
- 3.

NOTE: Follow manufacturers operating instructions for correct use of compression tester.

Thread in VAG 1381/12 adaptor in place of glow plugs. Check compression using VAG 1763 compression tester. See **Fig. 2**. Operate starter until tester displays no further increase in pressure. Record

compression readings for each cylinder.

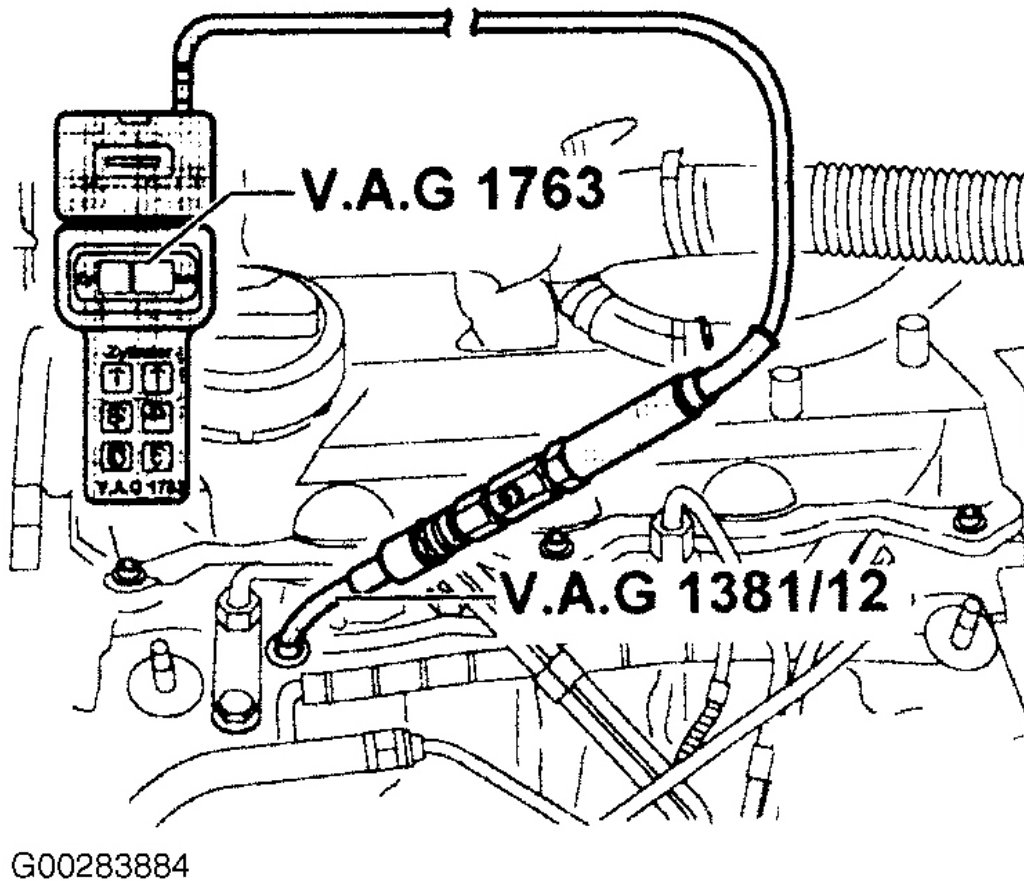


Fig. 2: Testing Compression Using VAG 1763
Courtesy of VOLKSWAGEN UNITED STATES, INC.

4. Check compression readings against specifications. See **COMPRESSION SPECIFICATIONS** table. If any cylinder reading is not as specified, repair as necessary.

NOTE: Glow plug tightening torque is 11 ft. lbs. (15 N.m).

COMPRESSION SPECIFICATIONS

Application	(1) Specification
Normal Compression Pressure	
New Engine	363-450 psi (25.0-31.0 bar)
Minimum Compression Pressure	276 psi (19.0 bar)

Maximum Variation Between Cylinders	73 psi (5.0 bar)
(1) Operate starter until tester shows no further increase.	

FUEL SYSTEM

FUEL DELIVERY & SYSTEM PRESSURES

WARNING: High fuel pressure may be present in fuel lines and component parts. Relieve pressure before attempting to open system for testing or component replacement. DO NOT allow fuel to flow onto engine or electrical parts or allow an open flame in area while testing fuel system components. DO NOT allow fuel to contact coolant hoses.

NOTE: Any fault pertaining to the fuel injection pump and fuel injection pump components will set DTCs. See appropriate SELF-DIAGNOSTICS article in ENGINE PERFORMANCE.

Visual Fuel Leak

Check for any visibly obvious signs of fuel leaks around engine, (i.e., look for clean areas on or near injection pump, injectors, and lines).

FUEL FILTER

Ensure fuel filter is not plugged. Place drain pan under fuel filter. With engine off, open drain valve on bottom of fuel filter until clean diesel fuel flows from drain tube. Close drain valve. It may be necessary to replace fuel filter if filter contains excessive water (replace filter if it contains more than half its capacity in water).

FUEL PUMP

This system is NOT equipped with an in-tank fuel pump. Diesel injection pump draws fuel directly from fuel tank.